

**ENVIRONMENTAL ASSESSMENT**

for

**Wisconsin Power and Light Company  
Wisconsin Public Service Corporation  
Madison Gas and Electric Company**

**Columbia Energy Center Units 1 and 2 Turbine and Pulverizer Upgrade Project**

**Docket 5-CE-141**

Joint Application of Wisconsin Power and Light Company, Wisconsin Public Service Corporation, and Madison Gas and Electric Company for a Certificate of Authority to Upgrade and Replace the Coal Pulverizers and Steam Turbines at the Columbia Energy Center Units 1 and 2

**December  
2013**

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## Introduction

Wisconsin Power and Light Company (WP&L), Wisconsin Public Service Corporation (WPSC), and Madison Gas and Electric Company (MGE), (together, Applicants), applied to the Public Service Commission of Wisconsin (PSC or Commission) for authority to (1) construct, install, and place in operation 12 new coal pulverizers and (2) upgrade two steam turbines at the Columbia Energy Center (Columbia) near Pardeeville, Wisconsin. If the Commission approves the project, it will issue a Certificate of Authority (CA) to the Applicants.

The Commission does not intend to hold a hearing for this project. A Notice of Investigation was issued on October 10, 2013.<sup>1</sup>

This was determined to be a Type II action under Wis. Admin. Code § PSC 4.10(2). Under Wis. Admin. Code § PSC 4.10(2), Table 2.d, an environmental assessment (EA) is needed for the review of a construction project that will increase an electric generation facility's capacity significantly beyond its nominal design rating or extend the facility's life significantly. As part of the CA application review, the Commission is reviewing the potential environmental effects of the project.

***Note:** The utility will also apply to the Wisconsin Department of Natural Resources (DNR) for air pollution control permits under Wis. Stat. ch. 285. The level of expected pollutant emissions could increase on an annual basis because the increased efficiencies resulting from the improvements could lead to increased utilization of the plant.*

All of the proposed construction activities would occur within the existing power plant site, either within a building or within the fenced boundaries of the plant. There have been no inquiries about the project from the general public or adjacent neighbors to the site. Notification of the Commission's intent to prepare an EA, including a solicitation for comments on the environmental aspects of this project, was mailed to local officials, intervenors, and the Applicants.<sup>2</sup>

Five individuals or organizations requested to intervene in the Commission review.<sup>3,4</sup> The intervenors were notified about the preparation of an EA through the notification letter in the Commission's Electronic Regulatory Filing system and/or through an later e-mail message directing them to the letter.<sup>5</sup>

The Gas and Energy Division of the Commission prepared this EA, in cooperation with the DNR Bureau of Energy, Transportation and Environmental Analysis, to determine if an environmental impact statement (EIS) is necessary under Wis. Stat. § 1.11. A preliminary determination will be made concluding whether preparation of an EIS is warranted. This preliminary determination will

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<sup>1</sup> PSC REF #191586.

<sup>2</sup> PSC REF #190454.

<sup>3</sup> Citizens Utility Board (CUB), RENEW Wisconsin (RENEW), Wisconsin Industrial Energy Group (WIEG), Robert H. Owen, Jr.

<sup>4</sup> PSC REF #191503.

<sup>5</sup> PSC REF #191495.

be followed by a public comment period of at least 15 days. Sections 5.0 and 6.0 of this document address the Commission's compliance with Wis. Admin. Code § PSC 4 and Wis. Stat. §1.11.

## **1. Project Description**

### ***1.1 Facility Location and Background***

As mentioned previously, the proposed project is located on the Columbia property. The new equipment would be installed on that existing industrial site, replacing older equipment, and sharing infrastructure and resources with it.

Columbia is in Pardeeville, Wisconsin, in Columbia County. The property is located in the southwest portion of the town of Pacific, between U.S. Highway (USH) 51 and the Wisconsin River, on land above the elevation of Wisconsin River wetlands. The plant is about 4.5 miles south of the city of Portage near the junction of State Trunk Highway (STH) 16 and USH 51.

The three electric utilities who are the Applicants jointly own Columbia. WP&L owns 46.2 percent of the plant, while WPSC and MGE own 31.8 percent and 22 percent, respectively. Although co-owned, Columbia is operated solely by WP&L.

Columbia consists mainly of two generating units, Units 1 and 2, each of which is a tangentially-fired boiler and an associated turbine generator. Columbia Units 1 and 2 were placed into operation in 1975 and 1978 and have nameplate generation capacities of 512 and 511 megawatts (MW), respectively. The two boilers are steam generators with "Controlled Circulation Radiant Heat." Their maximum continuous capacity is 3,800,000 pounds per hour (lbs/hr) main steam flow at 2,620 pounds per square inch (lbs/in<sup>2</sup>) and 1,005 degrees (°F). The boilers each fire sub-bituminous Powder River Basin (PRB) coal from various mines, and each have six coal pulverizers and six elevations of burners.

Two additional project proposals for improvements at Columbia recently received CAs from the Commission, and construction of both projects is still in progress. One project is the installation of dry flue gas desulfurization (FGD) systems and downstream baghouses for the Units 1 and 2 and modifications to the existing activated carbon injection (ACI) systems to reduce sulfur dioxide (SO<sub>2</sub>) and mercury (Hg) emissions, at a cost of \$627 million.<sup>6</sup> The other project, with a cost of \$19,225,000, is building two new cooling tower units to replace the existing ones because structural failure is occurring despite regular maintenance.<sup>7</sup> A fourth project, for which an application to the Commission is expected soon, would install and operate a selective catalytic reduction (SCR) system for Unit 2 that could be in service by the end of 2018.<sup>8</sup> The cost for this plant addition would be approximately \$230 million.

The in-service dates for the two existing turbines for Units 1 and 2 are 1975 and 1978, respectively. They consist of one dual flow, combined high-pressure and intermediate pressure section and two dual flow low-pressure sections connected to a generator.

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<sup>6</sup> PSC docket 5-CE-138, Final Decision, PSC REF #145848.

<sup>7</sup> PSC docket 5-CE-140, Final Decision. PSC REF #177662.

<sup>8</sup> PSC docket 5-CE-141, Application, page 11.

The low-pressure (LP) turbine rotors are showing a corrosion condition known as “stress corrosion cracking”<sup>9</sup> where the rotors have dovetail notches to attach the turbine blades to the rotor. In the most recent major turbine outage inspections, pitting and several small cracks were found on the rotors at the dovetail attachment sites. The turbines were returned to service, but the utilities determined that it is time to prepare for repair during the next turbine outage.

Twelve existing Combustion Engineering (now Alstom) coal pulverizers, six per unit, also date from the initial construction of the plant. The Applicants state that the pulverizers have reached the end of their useful life.<sup>10</sup> They cite erosion in the main housing and roofs that are leading to thinning, cracking, and deformation, which in turn will lead to increased coal leakage and fugitive dust. Fugitive dust is a safety issue at the plant, and the pulverizers must be shut down and repaired when coal leaks are identified.

## **1.2 Project Purpose and Need**

The Applicants state that proposed project is not needed to meet the Applicants’ near-term energy or capacity needs. The turbines and pulverizers are in need of major maintenance because of mechanical damage buildup in the pulverizers and corrosion buildup in the turbines. The Applicants have stated that the proposed combination of upgrades will enable greater efficiencies from the existing units. The efficiencies include:

- An estimated reduction in the heat rate of about 440 British thermal units (Btu) per kilowatt hour (kWh) on each unit, which reflects about a 4.0 percent increase in efficiency. The heat rate is the amount of fuel required to produce one kWh, so less fuel is projected to be needed.
- A total plant operating capacity increase of about 95 MW, an increase in the daily average energy production from each unit of about 9.0 percent.
- A reduction of air emission intensity in pounds per megawatt hour (MWh) due to improved operating efficiencies.

The Applicants hope to improve the performance of the two Columbia units by:

- a) resolving the stress corrosion cracking concern in the LP steam turbine rotors by replacing the rotors and turbine casings.
- b) improving the reliability and reducing the maintenance costs of the coal pulverizing systems by replacing them with newer systems.

The Applicants estimate that these benefits, minus the capital and operating costs, would provide a net customer benefit of about \$ 103 million in present value revenue requirements (PVRR). The benefit would be increased by savings resulting from avoiding maintenance costs on the existing pulverizer equipment and steam turbines.

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<sup>9</sup> Application, pages 4-5, Appendices D and H.

<sup>10</sup> Application, page 6.

### **1.3 Longevity of the Columbia Energy Center**

The project application does not indicate whether the project would enable Columbia's useful life to be extended significantly. However, if the replacement equipment is necessary for more efficient operation of the plant, it likely will help the plant to continue to produce over the useful life that has already been projected. After the most recent depreciation study, the useful life of each of the plant's two units was set at 2035 and 2038, respectively.

The Commission dockets approving the air pollution control equipment and the new water cooling towers did not directly extend the estimated useful life beyond these two dates and the Applicants state that the proposed project would not increase the estimated useful life of the units beyond these two dates.<sup>11</sup> Combined with the two ongoing FGD/Hg and cooling tower construction projects, a future project to install selective catalytic reduction equipment to control nitrogen oxides (NO<sub>x</sub>), and on-going maintenance, the two existing Columbia units likely would be positioned to continue operation in compliance with existing regulations until 2035 and 2038.

However, two intervenors in the docket, Mr. Robert Owen and RENEW Wisconsin (RENEW), have expressed concerns about the estimated useful life of the plant and the air pollutants that would be emitted from the Columbia units through that life expectancy. They argue that the construction of this proposed project, the projects that have preceded it, and the expected SCR project all could combine to extend the lifespan of very large coal units in Wisconsin that may soon be subject to U.S. Environmental Protection Agency (EPA) rules regulating carbon dioxide (CO<sub>2</sub>) emissions to the extent that the feasibility of the station may be at risk. These emissions concerns are discussed below in the environmental analysis section.

The Applicants' stated alternative to the proposed project would be to use a combination of repairs and replacement components "using the same technology that was deployed when the units were placed into service in the 1970s."<sup>12</sup> Thus, the proposed turbine replacement may be a more efficient alternative solution to continuing the turbine upgrade work during scheduled routine outages. The Applicants state that the pulverizers do not require an outage to be installed.

According to the Applicants, with or without the improvements proposed in this docket, over 1,000 MW of existing coal-fired generation and its associated air emissions would be maintained in Wisconsin's generation fleet to 2035 or 2038, depending on the boiler unit. They state that this operation would be more efficient, and the emissions would be potentially lower if the proposed upgrades are installed.

### **1.4 Project Design**

#### **1.4.1 Modifications to turbines**

The proposed turbine project is designed to upgrade the high-pressure/intermediate-pressure (HP/IP) and LP turbines of both Columbia units. It would effectively result in two new steam turbines utilizing the existing foundation, outer turbine casing, generator, exciter, valves, and other turbine equipment and connections but equipped with new rotors and inner turbine casings. A

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<sup>11</sup> Applicants' Response to Data Request 1-KR-5. PSC REF #193171.

<sup>12</sup> Application, p. 2.

modified steam path would consist of fully bladed rotors and associated blade diaphragms, seals, glands, and so forth. The Applicants state that new design would have higher reaction, lower pitch diameters, longer blades, and an increased exhaust annulus area, plus a higher stage count within the same turbine length to provide a “dense pack.”

These improvements enable increased energy production from the same amount of steam by extracting more energy out of each pound of steam passing through the turbines.<sup>13</sup> The Applicants state that the upgraded turbines would require less steam per MWh of power produced, which would translate into an equivalent reduction in coal burned per MWh, resulting in reductions in fuel cost and air emissions. Less coal burned per MWh equates to an increase in energy production per unit of coal burned. This increased energy production can make better utilization of the existing generator capacity.

A vendor has not yet been selected by the Applicants.

#### **1.4.2 Modifications to coal pulverizers**

The proposed pulverizer project would involve the replacement of all 12 existing pulverizers, six per each of the two boiler units.

Each of the six pulverizers per boiler unit have a design capacity to deliver about 138,000 pounds of pulverized coal per hour to the boiler. Each pulverizer is supplied with coal by a gravimetric-type feeder.

According to the Applicants, the new pulverizers would be complete vertical spindle type pulverizers with rotating “dynamic classifiers” that help improve the consistency of ground coal particle size and distribution, and result in more finely ground coal for the boilers.<sup>14</sup> The rotating classifiers would allow finely ground coal to escape the pulverizer into the boiler but return coarser coal particles back to be reground. In addition to improved grinding performance, the new pulverizers would have design improvements that require less maintenance and are more reliable. They would also include a new “pulverizer inerting” system to reduce the frequencies of potentially dangerous explosions and to provide fire protection.

The Applicants claim that utilizing the fuel from the new pulverizers, would improve the combustion performance and efficiency of the boilers. The new pulverizers could also, according to the Applicants, allow the two Columbia units to sustain their currently achievable nitrogen oxide (NO<sub>x</sub>) emission rates more consistently and reliably to comply with the current air permit, while producing more energy. This is not a manufacturer/supplier guarantee, but a possibility.

#### **1.4.3 Modifications to the existing Columbia site**

Modifications to the existing Columbia site, aside from the turbine upgrades and pulverizer replacements, would appear to be very minor and temporary.

The steam turbine upgrades and coal pulverizer replacements would be installed within the primary plant buildings, within the existing footprint of the plant, and contained almost entirely within the space occupied by the equipment being removed. On-site storage and laydown space would be

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<sup>13</sup> Application, pages 13-14.

<sup>14</sup> Application, page 14.

within the space immediately surrounding those buildings, with a slight increase in site congestion estimated. When the existing equipment is disassembled, the materials are expected to be transferred to a location where they can be sold or scrapped. The Applicants conclude that site congestion and disruption would be “minimal.”<sup>15</sup>

The new steam turbine parts would be installed during a scheduled turbine maintenance outage and the installation would not interfere with normal plant operation.

The existing Columbia water intake and wastewater facilities would be adequate to handle the needs of the two units with their new equipment and efficiencies and would not require modification.

The Applicants are not currently evaluating any new electric transmission interconnection options.

#### **1.4.4 Project cost and financing**

The capital cost for the project would total about \$ 130 million, not counting allowance for funds used during construction (AFUDC).

The turbine upgrade component would total about \$ 74.9 million, including purchase, installation and testing, instrumentation, engineering fees, and costs for WP&L to manage the project.

The pulverizer replacement component would total about \$ 55.1 million, including purchase, integration with other power plant components, engineering fees, construction management, and costs for WP&L personnel to manage the project.

The project cost would be financed “in a manner consistent and compliant with the individual Applicants’ utility capital structures and Commission-approved financing authorizations.”<sup>16</sup> The Applicants expect traditional utility rate treatment in future rate proceedings for all the project costs.

Commission staff is investigating whether this project is needed and more cost-effective than simply making the repairs and replacements in a routine manner as done in the past. Project cost is expected to be an important issue in the Commission decision in the case.

#### **1.4.5 Applicants’ projected project schedule**

The Applicants have roughly estimated a goal of placing both components of the project on line and in service by the fourth quarter of 2017.

To meet that timeframe, they would like to begin construction of the pulverizer replacements in spring 2015. Procurement and installation of the pulverizers is expected to be completed by summer 2017. Installation of the turbine parts would be completed on Unit 1 in 2016 and Unit 2 in 2017.

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<sup>15</sup> Application, page 13.

<sup>16</sup> Application, page 26.



The Applicants might begin the engineering for the turbines and pulverizers while the CA application is being reviewed. They state that fabrication of the components or installation would not begin until (unless) a CA has been issued.<sup>17</sup>

## **1.5 Permits and Approvals**

### **1.5.1 PSC**

Before construction on the proposed project is allowed to proceed, a CA is needed from the PSC under Wis. Stat. § 196.49.

### **1.5.2 DNR**

According to the Applicants, two potential permits could be required from DNR for the proposed project under certain circumstances: a storm water permit and an air permit.

Regarding DNR permits, three recent construction case reviews have already provided most of the permitting and approval work. These reviews included the recent Columbia construction cases involving the Emissions Reduction and Cooling Tower Replacement Projects<sup>18</sup> and WP&L's Nelson Dewey Unit 3 power plant project in 2007, which included an alternative site at Columbia.<sup>19</sup> Studies were performed by the Applicants for these projects and, when the applications for them were filed, DNR permits and approvals were obtained.

The Applicants maintain that “nothing has changed for evaluating the presence of features that could be impacted by the pulverizer replacement and steam turbine upgrade project.”<sup>20</sup> There would be no change in water consumption, and no change in wastewater discharge constituents or rates from plant operations after the pulverizers and turbine upgrades were installed and operating.<sup>21</sup> There would also be no increase in the rate of production of solid wastes and, with the expected increase in unit efficiency there could be a decrease in solid waste production on a per MWh basis. Alternatively, if the efficiency increase results in increased utilization and plant operation, there might be an increase in solid wastes from coal combustion that results, depending on the offsets of efficiency and increased utilization.<sup>22</sup>

A study of potential impacts on threatened or endangered species completed for the proposed Nelson Dewey project is applicable to the present proposed project and docket. Construction activities would occur almost entirely inside the existing plant, and construction laydown would be on previously disturbed WP&L property. No direct adverse impacts on these resources would be expected, and no further investigations or actions would likely be required.<sup>23</sup>

While there would be no change in wastewater discharge constituents or rates from plant operations if the project is installed, a Construction Site Storm Water Runoff General Permit could

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<sup>17</sup> Application, page 22.

<sup>18</sup> PSC dockets 5-CE-138 and 5-CE-140.

<sup>19</sup> PSC docket 6680-CE-170.

<sup>20</sup> Application, page 55.

<sup>21</sup> Application, page 57.

<sup>22</sup> Application, page 56.

<sup>23</sup> Application, page 56.

be needed from DNR prior to construction if the construction were to disturb more than one acre of land. DNR has received no application for storm water work at the time this EA is being prepared.<sup>24</sup>

Regarding air pollution issues, the project is not expected to increase air pollution emissions on a pounds-per-hour basis and could reduce emissions of NO<sub>x</sub>. If the project succeeded in improving generation efficiency overall, it could result in a decrease in all pollutant emissions on a pound-per-MW basis.

However, if the improved efficiency occurred and resulted in a demand for increased utilization of the Columbia units, there could be a resulting increase in emissions. The Applicants state that the potential increase in emissions would be quantified and included in an air permit application that would be reviewed and approved before construction on this project could begin. They also state that emission changes projected from this project could be required to be aggregated with the expected emission changes associated with the Emissions Reduction project (PSC docket 5-CE-138).<sup>25</sup> Although a Prevention of Significant Deterioration (PSD) Air Construction Permit would be needed from DNR before construction could begin, no air pollution control application has been submitted to DNR for this project at the time of preparation of this EA; but, the application could be submitted to DNR during the first quarter of 2014.<sup>26</sup>

Greenhouse gases (GHGs), including CO<sub>2</sub>, are considered by EPA to be “air pollutants” covered under the PSD and Title V programs of the Clean Air Act (CAA). In Wisconsin, the regulation of GHG emissions by EPA is done through the DNR air pollution control permitting process.

If this project led to increased plant usage and a need for a new air permit, and if the proposed plant emissions exceeded a criteria threshold under pending federal law, DNR could require the Applicants’ air permit to apply Best Available Control Technology (BACT) for CO<sub>2</sub> or CO<sub>2</sub> equivalents. However, at the time of preparation of this EA, neither CO<sub>2</sub> nor nitrous oxide (N<sub>2</sub>O), normally emitted in some quantity by fossil fuel-fired power plants, are regulated under the CAA or the Wisconsin Administrative Code. No official State Implementation Plan has yet been put into action. There are no specific control requirements, standards, or BACT in state code. The final determinations regarding N<sub>2</sub>O and CO<sub>2</sub> emission limits could be part of a DNR air pollution control permit if the change in emissions is deemed to be a major increase.

At the federal level, the EPA has proposed New Source Performance Standards (NSPS) for CO<sub>2</sub> emitted from new coal-fired units based on partial implementation of carbon capture and storage as the “best system of emission reduction” (BSER).<sup>27</sup> The proposed project would likely not qualify as a new source but would be considered an upgrade at an existing source. The Applicants have no plans at this time for developing an approach to carbon capture and sequestration.<sup>28</sup> At the time of preparation of this EA, EPA is currently engaged in listening sessions to help it determine how to

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<sup>24</sup> E-mail communication from Ryan Lentz, DNR Bureau of Watershed Management, November 12, 2013.

<sup>25</sup> Application, page 55.

<sup>26</sup> E-mail communication from Thomas Karman, DNR Bureau of Air Management, November 7, 2013.

<sup>27</sup> U.S. Environmental Protection Agency. Proposed Rule, 40 CFR Part 60. *Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units*. Docket ID No. EPA-HQ-OAR-2013-0495; FRL-9839-4.

<sup>28</sup> Applicants’ Responses to Data Request 1-KR-6 and 1-KR-7. PSC REF #193172 and #193173.

set standards for existing coal-fired units. In Wisconsin, DNR recently completed a series of meetings with stakeholders to help it determine whether to comment on EPA's efforts. The process has a long way to go, including potential litigation of EPA's proposed new standards, before a clear path is set for permitting for CO<sub>2</sub> emissions.

### **1.5.3 WHS**

The Wisconsin Historical Society (WHS) was consulted by the Applicants and Commission staff during the review of the Emissions Reduction docket (5-CE-138). WHS did not identify any adverse impacts to listed historic properties under Wis. Stat. § 44.40. There are no listed historic properties in the construction footprint for the proposed pulverizer and turbine project.

### **1.5.4 Brownfields requirement**

Under Wis. Stat. § 196.49(4), brownfields as defined in Wis. Stat. § 238.13(1)(a) must be considered. The proposed project would be within the footprint of Columbia, the most appropriate location if the project is approved.

### **1.5.5 Local permits**

Locally, an Erosion Control Permit would be needed from the town of Pacific before site clearing and grading could begin.

## **2. Environmental Analysis**

There would be potential impacts from constructing and operating the new facilities. These are discussed below.

### **2.1 Potential Construction Impacts**

All of the actual construction work for the turbines and the pulverizers would occur within the primary plant buildings and adjacent yard to those buildings at Columbia. The Applicants state that all equipment would be installed within the existing footprint of the plant and be contained almost entirely within the space occupied by the equipment being removed. The turbine room would look identical before and after the turbine upgrades. The pulverizer bay would have some equipment repositioned to provide improved access for maintenance.

Diesel-powered construction equipment would emit exhaust composed of several urban hazardous air pollutants, such as acetaldehyde, acrolein, benzene, 1,3-butadiene, formaldehyde, and polycyclic aromatic hydrocarbons, plus carbon-based particulates. If the construction site is appropriately ventilated for employee safety, the amount of air pollution emitted would be low.

Impacts beyond the plant property could include small increases in vehicular traffic, construction fugitive dust, and construction debris removal. All land disturbance would be on Columbia plant property. Outdoor work would include on-site equipment storage and laydown in the yard space surrounding the primary plant buildings. An area greater than one acre in total could be disturbed leading to the potential for storm water impacts. Construction is not expected to alter local geology. Blasting would not be needed. There could be a slight increase in the degree of on-site congestion associated with normal plant operations. No adverse impacts due to construction are expected in or near the nearby Wisconsin River. No power plant construction activities are

required in the river or on its banks. The proposed project area is not within the assumed 100-year floodplain of the river.

There would be no increase in solid waste expected from the project, beyond removal of deconstructed equipment.

No protected species or natural communities or landscape elements of concern are known to exist on the power plant property. The Applicants state that, based on the reviews of the Natural Heritage Inventory database, no construction impacts are expected to threatened, endangered, or special concern species. No archeological or historic properties would be adversely affected in the project area.<sup>29</sup>

Not more than one coal pulverizer would be expected to be out of service at any particular time, and normal availability would be five pulverizers for each unit at all times. While the pulverizers would be installed during normal plant operations, the steam turbine upgrades would be made during a scheduled turbine overhaul outage that is between five and eight weeks in duration for each unit. Normal operations would be those associated with a schedule overhaul outage.

Noise or visual impacts do not appear to be a concern. Several residences are neighbors of the property but are none near the units where the main construction work would occur. Zoning ordinances set limits for noise during construction of the plant. The existing visual landscape of the project site is the existing power plant facilities. During construction, activities on the site might hardly be noticed by some people but might appear slightly chaotic to others. There could be some additional lighting at the construction site or laydown area, but it is unlikely that it would be noticed from beyond the property due to the existing power plant property lighting.

Overall, none of the potential construction impacts are expected to be significant. Most of the direct impacts during construction of the plant would be temporary in nature.

## ***2.2 Potential Operational Impacts***

### **2.2.1 Air pollution emissions**

Coal as a fuel is an important source of air pollutant emissions, including CAA criteria pollutants, hazardous air pollutants (HAPs) such as Hg, and GHGs. With the expected life of Units 1 and 2 standing at 2035 and 2038, respectively, pollutant emissions from this plant are expected to continue through that time period. Based on the proposed project, these emissions could decrease or increase in future years through the end of the plant's useful life.

#### **2.2.1.1 Efficiency increase and pollution decrease**

The new pulverizers and steam turbine upgrades would not be expected to cause an increase in air pollutant emissions on a pound-per-hour basis. The Applicants state that the new pulverizers would actually decrease the NO<sub>x</sub> emissions in pounds per hour. They also state that, overall, the pulverizers and the turbine upgrades would improve the efficiency of Units 1 and 2 resulting in a decrease in air pollutant emissions on a pound-per-MW output basis.<sup>30</sup>

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<sup>29</sup> Application, page 56.

<sup>30</sup> Application, page 55.

The Applicants project the increases in efficiency in terms of an estimated reduction in the heat rate of about 440 Btus per kWh for each unit, leading to about a 4.0 percent efficiency improvement for each. Commission staff is attempting to verify the expected efficiency gains, as they are not a certainty.

#### **2.2.1.2 Utilization increase and pollution increase**

As stated elsewhere, if the improved efficiency of the units were to occur as a result of this project being approved and implemented, one or both of the units could experience increased utilization if the Midcontinent Independent System Operator, Inc. (MISO) determines that the economics are reasonable. The increased efficiency may decrease air pollutant emissions but increased utilization could increase air pollutant emissions and at least partially offset the emission reductions from the increase in efficiency.

The potential annual increase in criteria pollutants, hazardous air pollutants (HAP), GHGs, and other emissions would be quantified by the Applicants and submitted as part of an air permit application to the DNR in 2014 if this project is approved by the Commission. State air permits regulate emissions of the six criteria pollutants and other classes of pollutants in Wisconsin including HAPs, which include Hg. DNR staff would determine what, if any, additional controls or limitations are required to achieve the air quality control standards based on the projected emissions increase from the project. Until DNR staff is provided quantified information about the possibility for increased utilization of Columbia and the potential increase in emissions, it cannot determine whether any pollutant would be subject to BACT.<sup>31</sup>

#### **2.2.1.3 Greenhouse Gases**

It is expected that GHGs would be addressed in the DNR air pollution control permit for this project. At this time, if the 95 MW increase in capacity and emissions triggered a New Source review, the power plant emissions could exceed the criteria threshold under pending federal law and require the application of BACT by winter 2014. If a New Source review not required, the potential change in CO<sub>2</sub> emissions would be reviewed to determine whether it constituted a major increase in CO<sub>2</sub>. If so, application of BACT could be triggered.

The Applicants have provided estimates of CO<sub>2</sub> that would be emitted by each Columbia unit before and after the new coal pulverizers and turbines are installed with each unit operating at the expected heat rates. Table 1 illustrates the differences in the “before” and “after” CO<sub>2</sub> emissions. CO<sub>2</sub> equivalents of methane (CH<sub>4</sub>) and N<sub>2</sub>O emitted would be about 0.5 percent of the CO<sub>2</sub> emissions. The Applicants state that the CO<sub>2</sub> increase of about 4.5 percent would be accompanied by an energy output increase of about 9.4 percent, so that the effective net CO<sub>2</sub> emission rate per incremental energy output is about eight percent less than the average emissions from natural gas units.<sup>32</sup>

**Table 1                      Current CO<sub>2</sub> emissions before project installation and projected emissions after installation (millions of tons)**

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<sup>31</sup> E-mail communication from Steve Dunn, DNR Bureau of Air Management, November 13, 2013.

<sup>32</sup> Applicants Response to Data Request 1-KR-2. PSC REF #193168.

	2016 (Unit 1) or 2015 (Unit 2)	2018 (Unit 1) or 2017 (Unit 2)	Difference
<b>Unit 1</b>	3.98	4.17	0.189
<b>Unit 2</b>	3.82	3.99	0.175
<b>Total plant</b>	7.81	8.16	0.364

The Applicants project a slight decrease in CO<sub>2</sub> emissions after the air pollution control equipment approved in PSC docket 5-CE-138 is installed and operating.<sup>33</sup> They project CO<sub>2</sub> emissions to remain at around 4.17 million tons per year (TPY) over the years until 2035 for Unit 1 and to bounce slightly between 3.73 and 4.00 million TPY until 2038 for Unit 2, as shown in Table 2.<sup>34</sup>

**Table 2**      **Estimated CO<sub>2</sub> emissions per year after completion of the turbine and pulverizer project**

Year	Unit 1 CO <sub>2</sub> Emissions	Unit 2 CO <sub>2</sub> Emissions
2016		3.73
2017	3.88	3.99
2018	4.17	3.99
2019	4.17	4.00
2020	4.17	4.00
2021	4.17	4.00
2022	4.17	4.00
2023	4.17	4.00
2024	4.17	4.00
2025	4.17	4.00
2026	4.17	3.73
2027	3.88	4.00
2028	4.17	4.00
2029	4.17	4.00
2030	4.17	4.00
2031	4.17	4.00
2032	4.17	4.00
2033	4.17	4.00
2034	4.17	4.00
2035	4.17	4.00
2036		3.73
2037		4.00
2038		4.00

Units 1 and 2 at Columbia are expected to operate until 2035 and 2038, respectively, whether or not the proposed project improvements are installed. Between the time of the new equipment installation and those dates, the total amount of CO<sub>2</sub> emitted would be about 78.7 million tons from Unit 1 and about 91.2 million tons from Unit 2, totaling about 169.8 million tons of CO<sub>2</sub> by 2038. Emissions of CH<sub>4</sub> and N<sub>2</sub>O would be about 0.5 percent of the CO<sub>2</sub> emission equivalents, or about 0.10 million tons of additional CO<sub>2</sub> equivalents, for a total of about 169.9 million tons of CO<sub>2</sub> equivalents from the two Columbia units by 2038.

<sup>33</sup> Applicants Response to Data Request 1-KR-3, PSC REF #193169.

<sup>34</sup> Applicants Response to Data Request 1-KR-4, PSC REF #193170.

If the project is not approved and conventional repairs periodically are made to the turbines and pulverizers, more fuel could be burned per energy output and potentially more CO<sub>2</sub> emitted over these years. Alternatively, if the project is approved and the units are requested to run more because of their increased efficiency, the increased output would require more fuel and thus the CO<sub>2</sub> emissions could be higher.

The potential impacts of GHG emissions on global climate change and its potential environmental and social effects are described, among other sources, in the reports of the Intergovernmental Panel on Climate Change, the scientific body set up by the World Meteorological Organization, including its recent issue, *Climate Change 2013: The Physical Science Basis*. The finalized version of the report's *Summary for Policymakers* was published on 11 November 2013 and is available for download.<sup>35</sup>

Many of the potential impacts of climate change worldwide and in Wisconsin, including costs of mitigation (in 2008), are summarized in the EIS issued by the PSC and DNR in 2008 that discusses WP&L's proposed Nelson Dewey Generating Station Unit 3.<sup>36</sup> Since the publication of that EIS, news and information about the potential impacts of global climate change have greatly increased in volume, and in many cases, severity, including melting of the permafrost layer in the arctic<sup>37</sup> and acidification of the oceans.<sup>38</sup>

At the time of preparation of this EA neither CO<sub>2</sub> nor its equivalents are actively regulated under the CAA or Wisconsin Administrative Code. There are no specific control requirements for the Columbia boilers, and there may be no other similar facilities available for comparison that have GHG controls classified as BACT. However, if a permit application is submitted, DNR could apply BACT for GHGs in its air pollution control permit, depending on the extent of the increased emissions. If it does so, the final determination of N<sub>2</sub>O and CO<sub>2e</sub> emission limits would be part of the DNR air permit.

For GHGs in particular, the BACT determinations that DNR has completed for other projects require only a fixed rate of CO<sub>2</sub> per MWh or some equivalent to that. DNR staff has indicated that it would take a fresh look at any new BACT application resulting from this project, but at this time staff cannot speculate about the results of its future determination. To date, DNR has not required add-on controls at any power plant for GHGs.<sup>39</sup>

### **2.2.2 Solid waste**

Because of the expected increase in combustion efficiency, there could be a decrease in coal combustion by-products, including bottom and fly ash, and other solid waste production per MWh. Coal ash contains contaminants such as Hg, other heavy metals, and arsenic. However, because of

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<sup>35</sup> Intergovernmental Panel on Climate Change. Summary for Policymakers of the Working Group I contribution to the Fifth Assessment Report. See

[http://www.climatechange2013.org/images/uploads/WGI\\_AR5\\_SPM\\_brochure.pdf](http://www.climatechange2013.org/images/uploads/WGI_AR5_SPM_brochure.pdf).

<sup>36</sup> Public Service Commission of Wisconsin and Wisconsin Department of Natural Resources. *WP&L 300 MW Power Plant Final Environmental Impact Statement*. PSC docket 6680-CE-170. July 2008, pp. 135-152.

<sup>37</sup> Gass, Henry. "Oil Drilling Wastes, Long Buried under Canada's Permafrost, Leak into the Environment." *Environmental and Energy News*. November 15, 2013.

<sup>38</sup> Borenstein, Seth. "Scientists Warn of Hot, Sour, Breathless Oceans." *Associated Press*. November 13, 2013.

<sup>39</sup> E-mail communication from Steve Dunn, DNR Bureau of Air Management, November 13, 2013.

the expected increase in efficiency, there could be increased plant utilization with a corresponding increase in combustion solid waste products.

The amount of decrease or increase in ash and other combustion waste products resulting from new efficiencies and increased utilization is not known or cannot be estimated at this time.

### **2.2.3 Protected natural land or water resources**

No change would be expected in water consumption to operate the plant if the proposed project is completed. Likewise, there would be no change expected in wastewater discharge constituents or rates.

## **3. Evaluation of Reasonable Alternatives and Some of their Economic and Environmental Consequences**

### **3.1 No-Action Alternative**

No action at all will likely result in turbine breakdown and possibly pulverizer breakdowns that would result in the need for the Applicants to evaluate options for forced outages and repairs.

### **3.2 Other Alternatives Evaluated by the Applicants**

The only alternative to the project discussed in the Application is retaining the existing turbines and coal pulverizers and making the major repairs required to keep them operating in their current configurations. If the improvements are not installed, the 9.0 percent capacity increase, the efficiencies, and the potential operating savings, would likely not occur, nor would the potential requests by MISO for increased utilization and operation.

### **3.3 Other Alternatives Described in Wis. Stat. § 1.12(4), the State Energy Priorities**

Wisconsin Stat. § 1.12(4) states that in meeting energy demands the policy of the state is, to the extent cost-effective and technically feasible, consider options based on the following priorities, in the order listed:

- (a) Energy conservation and efficiency
- (b) Noncombustible renewable energy resources
- (c) Combustible renewable energy resources
- (d) Nonrenewable combustible energy resources, in the order listed:
  - (1) Natural gas
  - (2) Oil or coal with a sulfur content of less than 1%
  - (3) All other carbon-based fuels.

Wis. Stat. §196.025(1) states that the Commission shall implement those priorities in making “all energy-related decisions and orders.”



### **3.3.1 Applicants' position**

The Applicants state that application of the energy priorities statute is not appropriate to the analysis of this project proposal because the proposal is not meant to fulfill a capacity expansion need and is not requesting authorization to add an incremental new resource not already existing in the generation portfolio.<sup>40</sup> The Applicants developed their equipment specifications for the turbine and pulverizer work so that the replacement parts would operate within the existing electrical and mechanical capabilities of the existing Columbia generators, steam generators, heat rejection systems, balance of the power plant equipment, and existing transmission. They note that the potential 95 MW of additional capacity would not represent a 95-MW increase in reserve planning capacity, but rather an increase in the average amount of already installed capacity available with a more efficient heat rate.

The Applicants do estimate planning capacity increases of about 9 MW and 16 MW for Units 1 and 2, respectively, again as a result of the lower heat input that would be required for the existing plant. In modeling they show that this additional capacity is not driving the economics of the project, but is a beneficial result of the efficiencies gained. It also would not be substantial enough to delay construction of new capacity in the future.<sup>41</sup>

Considering the purpose of the project, the Applicants maintain that none of the higher-ranked energy priorities identified in the statute provide a cost-effective and technically feasible alternative to the project because all of them require additional construction and none of them actually address the turbine or pulverizer maintenance needs.<sup>42</sup>

### **3.3.2 Intervenor's position**

However, intervenor RENEW points out that the energy priorities apply whenever new generating capacity is contemplated.<sup>43</sup> The increased capacity, while being treated by the Applicants as a useful by-product of its project, is nonetheless potential additional capacity that the companies are electing to create by choosing to replace rather than repair the turbines and pulverizers. Because the additional capacity is coal-fired generation, even though it is produced from an existing system, RENEW argues that the project maintains a risky source of generation when other types of generation that would not continue emissions of GHGs are available. It maintains also, citing a report from Clean Energy Action<sup>44</sup> that coal mining, supply, delivery, and compliance with air standards are all in jeopardy in the coming years, making coal an increasingly risky source of electricity.<sup>45</sup>

Intervenor Robert H. Owen also cites the riskiness of coal-fired energy as well as its potential difficulty complying with future air emission limits.<sup>46</sup> He strongly suggests retiring the Columbia units and replacing them with some type of generation higher on the energy priority list, including

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<sup>40</sup> Applicants Response to Data Request 1-KR-1. PSC REF#193167.

<sup>41</sup> Application, page 32.

<sup>42</sup> Application, page 27.

<sup>43</sup> Vickerman, Michael, letter to Ken Rineer of the Commission staff. October 24, 2013. PSC REF #192802.

<sup>44</sup> Leslie Glustrom, Director of Research and Policy, Clean Energy Action. October 2013. "Warning: Faulty Reporting of US Coal Reserves: Why Reports of a '200 Year Supply' of Cheap US Coal Are Faulty and the Imperative of Repowering the United States"

<sup>45</sup> Vickerman, Michael, letter to Ken Rineer of Commission staff, November 5, 2013.

<sup>46</sup> Owen, Robert H., Jr. letters to Kenneth Rineer of Commission staff, September 23, 2013 and October 18, 2013.

possibly a combined-cycle natural gas-fired plant at the Columbia site, in addition to wind and solar energy. Mr. Owen also argues for and requests a hearing on the case and preparation of an EIS.

#### **4. List of Contacts**

Included in this section are individuals with whom staff has communicated and consulted about the case. Intervenor and Applicants' staff are not included in this list.

- Josh Brown, DNR Bureau of Energy, Transportation, and Environmental Analysis
- Tom Karman, DNR Air Management Bureau
- Steve Dunn, DNR Air Management Bureau
- Ryan Lentz, DNR Bureau of Watershed Management

#### **5. Wisconsin Environmental Policy Act Determination**

As stated in the introduction to this EA, the decisions for the proposed project have been determined to constitute a Type II action under Wis. Admin. Code § PSC 4.10(2). Under Wis. Admin. Code § PSC 4.10(2), Table 2.a, an EA is required for the review of a project that would “increase an electric generation facility’s capacity significantly beyond its nominal design rating, change the facility’s fuel type, add an additional fuel type, or extend the facility’s life significantly.” The potential capacity increase of 95 MW represents an approximate 9 percent increase in the existing nameplate capacity. The current expected life of Units 1 and 2 is 2035 and 2038, respectively. While the Applicants do not expect the plant to operate beyond these dates as a result of this project, the proposed project, in combination with other recent and future improvements, may make that physically possible if other potential economic or regulatory changes are not factored in.

Wisconsin Admin. Code § 4.20(2)(d) identifies ten broad factors that are useful to consider when evaluating whether an EIS is warranted for a given Commission action. The following subsections consider and discuss each of the ten factors with respect to this case.

##### ***5.1 Effects on Geographically Important or Scarce Resources, such as Historic or Cultural Resources, Scenic or Recreational Resources, Prime Farmland, Threatened or Endangered Species, and Ecologically Important Areas***

There are no significant effects on such resources that would differ significantly from the existing environmental situation at Columbia. The existing plant would not affect any known land resources or add a significant amount of additional pollution to the area waters or the air with the proposed repairs made. It is possible that increased efficiency of the plant would lead to increased utilization and increased air emissions. If increased utilization were to occur, the Applicants would need to consult and probably apply to DNR for new or revised storm water and air pollution control permits. Those permit applications would quantify the additional pollutants expected.

##### ***5.2 Conflicts with Federal, State, or Local Plans or Policies***

There are no conflicts with plans or policies at this time. There is potential for conflicts on air pollution compliance if EPA passes a rule in the near future with CO<sub>2</sub> standards for existing coal-fired power plants that would be difficult to meet. There is also a disagreement between the Applicants and the intervenors regarding whether Wis. Stat. §1.12(4), the state's energy priorities statute, applies to the proposed project.

### ***5.3 Significant Controversy Associated with the Proposed Action***

The proposed project has not generated controversy among nearby landowners or the adjacent community. Five organizations or persons have requested to intervene in the docket: CUB, RENEW, WIEG, IBEW, and Robert Owen. Their issues and concerns are described to some extent in this EA and they will have an opportunity to file formal comments for the Commission's review.

### ***5.4 Irreversible Environmental Effects***

The irreversible physical and social effects of the proposed project are difficult to quantify because it is unclear at this time how the proposed plant improvements would affect the future operation and utilization of Columbia Units 1 and 2. The ongoing and potentially increased emission of GHGs from Columbia could add to cumulative global climate change during the years between now and the time of the unit retirements in 2035 and 2038.

### ***5.5 New Environmental Effects***

No significant new environmental effects would occur as a direct result of this project. The potential for increased utilization of Units 1 and 2 would be an indirect effect of its increased efficiency and the magnitude of that increased utilization cannot be determined at this time.

### ***5.6 Unavoidable Environmental Effects***

Regardless of the outcome of this docket, Columbia is expected to continue to operate providing electricity for MGE, WPSC, and WP&L customers and to result in the types of water and air impacts that it is creating at this time.

### ***5.7 Precedent-Setting Nature of the Proposed Action***

The proposed action would not necessarily set a precedent for other similar actions. Replacement and repair of parts and equipment are common maintenance actions at power plants to keep them running efficiently. Two other modifications to Columbia, the addition of emissions reduction equipment and cooling tower replacement, have recently been approved, and at least one other modification proposal, for additional air pollution control equipment, is expected shortly. These types of upgrades are not unusual and such repairs have been made at other power plants in Wisconsin.

### ***5.8 Cumulative Effect of the Proposed Action when Combined with Other Actions and the Cumulative Effect of Repeated Actions of the Type Proposed***

As repairs and upgrades are approved for this coal-fired plant and others in the state, the generating units are able to be kept operating and providing electricity. They continue to emit air pollutants from the combustion of coal, release pollutants into surface waters through storm water events, produce solid waste, and create impacts on land resources.

Air emissions, and in particular GHG emissions, are the primary subject of several intervenors' comments in this docket. The Applicants have not indicated any plans for discontinuing the operation of Columbia until the 2035 to 2038 time frame whether the proposed project is approved or not. The content and quantity of these emissions could be altered by future air pollution control permits or permit modifications, but would likely continue through the life of the units regardless, incrementally adding to emissions from other sources to exacerbate GHG effects on global climate change.

If CO<sub>2</sub> regulations or limits are promulgated in the near future for modifications at existing plants, the number of years of operation feasible for Units 1 and 2 may be reduced, but the content and timing of such regulations are not a certainty at this time.

### ***5.9 Foreclosure of Future Options***

No options would be foreclosed by approval of this proposed project. However, the cost of the proposed project, in combination with possible future upgrades, could be applied to other generation alternatives.

### ***5.10 Direct and Indirect Environmental Effects***

The direct effects of this project would not be significant. Indirect effects of this project on the environment would possibly include the cumulative effects of continually increased GHG concentrations in the atmosphere and the potential global climate changes and resulting land and oceanic changes that result. However, the air emissions would continue with or without project approval and would only stop when or if regulation or economics dictate that Columbia coal-fired generation can no longer be run.

## **6. Recommendation**

This EA informs the Commissioners, the affected public, and other interested persons about the project proposal and its potential environmental and social impacts. Through data requests, additional research work and analyses, and a review of comments, Commission staff has attempted to provide factual information about the project in the event that the project is approved or permitted.

This EA concludes that modification and repair of the turbines and construction and operation of the proposed new coal pulverizers would have few local direct impacts and would not result in a significant additional impact on the human environment significantly beyond that already occurring from operation of the Columbia plant in its present condition. Thus, preparation of an EIS is not warranted. The basis for this determination is discussed in Section 5.

Given this conclusion, it is acknowledged that potential impacts of GHG emissions from fossil-fueled power plants around the state are not well-enough understood to be quantified and made an important part of Commission decisions on case-by-case situations. If an EIS were to be prepared, it might be more useful if prepared in collaboration with DNR as part of an investigative docket on the overall potential impacts of maintaining the state's current arrangement of electric generation.

**RECOMMENDATION:**

  X   Environmental review complete. Preparation of an environmental impact statement is not necessary.

       Prepare an environmental impact statement.

Submitted by: Kenneth C. Rineer  
Environmental Analysis and Review Specialist

Date: November 22, 2013

This environmental assessment complies with Wis. Stat. § 1.11. and Wis. Admin. Code § PSC 4.20.

By: Kathleen J. Guelsdorff  
WEPA Coordinator

Date: December 16, 2013

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Attachments